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Rev. 1.0, 2/2014

KIT34901EFEVB Evaluation Board

Featuring the MC34901 High Speed CAN Transceiver

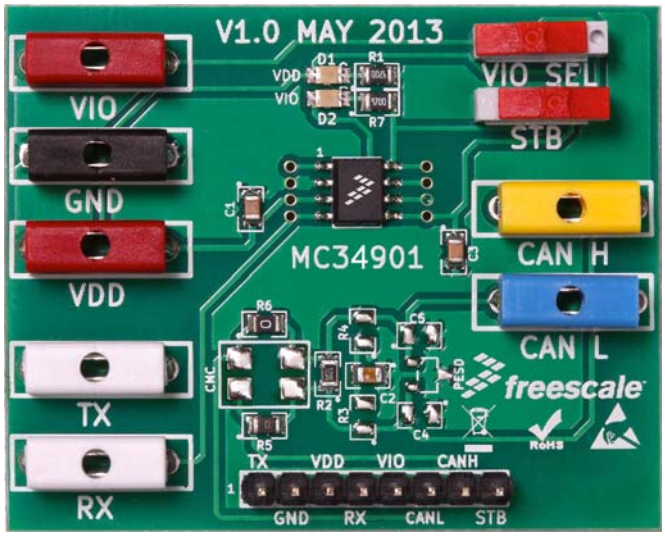

Figure 1. KIT34901EFEVB Evaluation Board

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1 Kit Contents/Packing List

- Assembled and tested evaluation board/module in anti-static bag
- Warranty card

2 Jump Start

- Go to www.freescale.com/analogtools
- Locate your kit
- Review your Tool Summary Page
- Look for

Jump Start Your Design

- Download documents, software, and other information

3 Important Notice

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This evaluation kit is intended for use of ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY. It is provided as a sample IC pre-soldered to a printed circuit board to make it easier to access inputs, outputs, and supply terminals. This evaluation board may be used with any development system or other source of I/O signals by simply connecting it to the host MCU or computer board via off-the-shelf cables. This evaluation board is not a Reference Design and is not intended to represent a final design recommendation for any particular application. Final device in an application will be heavily dependent on proper printed circuit board layout and heat sinking design as well as attention to supply filtering, transient suppression, and I/O signal quality.

The goods provided may not be complete in terms of required design, marketing, and or manufacturing related protective considerations, including product safety measures typically found in the end product incorporating the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. In order to minimize risks associated with the customers applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. For any safety concerns, contact Freescale sales and technical support services.

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4 Introduction

This evaluation board allows the user to implement and test the functionalities of the MC34901, High Speed CAN transceiver.

5 Evaluation Board Features

The KIT34901EFEVB Evaluation Board is an easy-to-use circuit board that allows the user to exercise the function of the MC34901, High Speed CAN transceiver.

- Supply from a single 5.0 V, or dual 5.0 V and 3.3 V supplies
- Local switches for single or dual supply selection
- Switches for device operating mode selection
- Footprint for optional CAN bus filter and protection component
- 8-pin Single In Line connector to access MC34901 device pins
- Two LEDs to display board and MC34901 state

6 MC34901 Device Features

The MC34901 provides the physical interface between the CAN protocol controller of an MCU and the physical dual wire CAN bus. They are packaged in an 8-pin SOIC with market standard pin out, and offer excellent EMC and ESD performance without the need for external filter components.

- MC34901 is a standalone High Speed CAN transceiver
- Available with several options and part numbers, for automotive and industrial applications
- Operates with 5.0 V and 3.3 V MCU using VIO input pin
- Normal and Low-power modes
- Device version with bus wake-up, which reports wake-up on the RXD pin

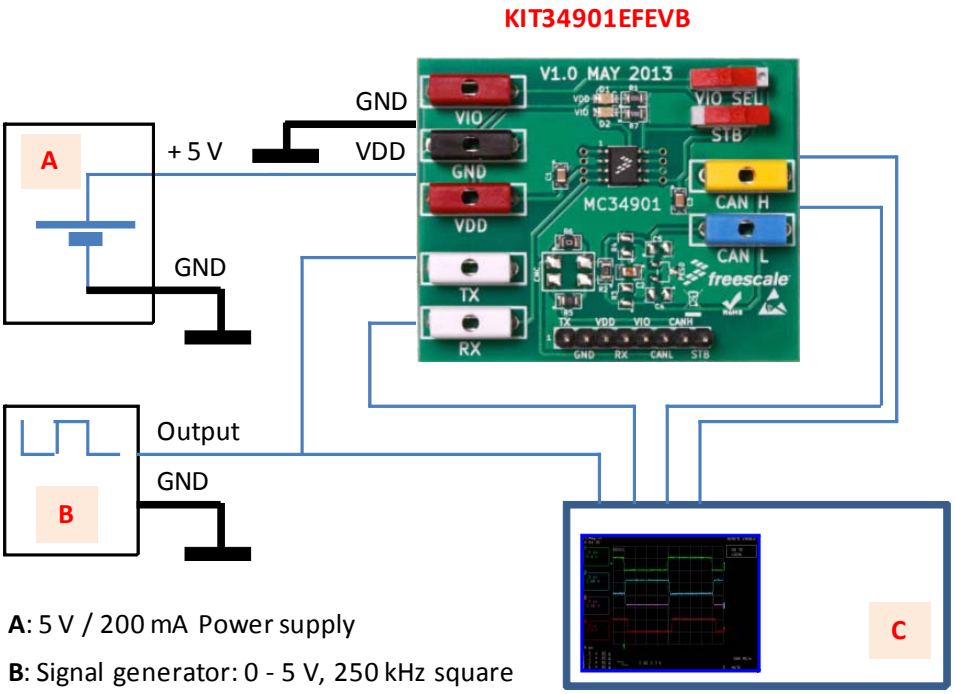
Freescale analog ICs are manufactured using the SMARTMOS process, a combinational BiCMOS manufacturing flow which integrates precision analog, power functions, and dense CMOS logic on a single cost-effective die.

7 Required Equipment

To use this kit you will need:

- 5.0 V power supply, 150 mA capability
- 3.3 V power supply, 50 mA capability. Usage of this second supply depends on the user requirement.
- Signal generator, output frequency up to 1.0 MHz and output voltage at least 5.0 V
- An optional oscilloscope to monitor the CAN signals
- Cables with 2.0 mm banana plugs

8 Evaluation Board Configuration with Single Power Supply



A: 5 V / 200 mA Power supply

B: Signal generator: 0 - 5 V, 250 kHz square wave, 50 % duty cycle

C: Oscilloscope

Figure 2. KIT34901EFEVB Board Setup with Single Power Supply

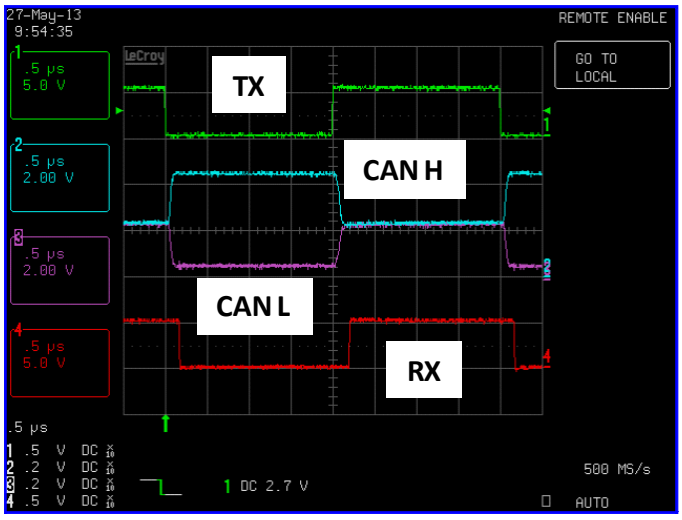
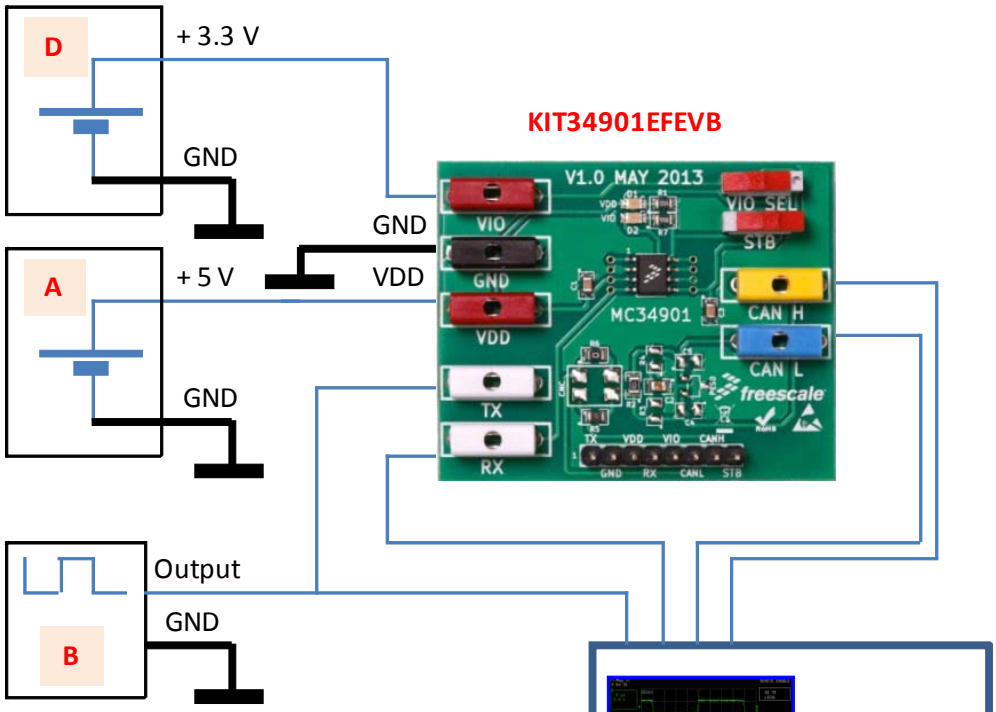


Figure 3. Output Signals

9 Evaluation Board Configuration with Dual Power Supply



A: 5 V / 150 mA Power supply

B: Signal generator: 0 – 3.3 V, 250 kHz square wave, 50 % duty cycle

C: Oscilloscope

D: 3.3 V / 50 mA Power supply

Figure 4. KIT34901EFEVB Board Setup with Dual Power Supply

10 Using the EVB

The KIT34901EFEVB and the MC34901 device can be used with a single 5.0 V supply, or with dual supplies 5.0 V and 3.3 V.

10.1 Single Supply

1. To use the board and device with a single supply, set the **VIO SEL** switch to left.
2. Set the power supply to 5.0 V.
3. To use the device in Normal mode, set the **STB** switch to right.
   - Connect a 0 - 5.0 V square signal to **TX**, frequency 250 kHz and duty cycle 50%.
   - Connect an oscilloscope to **CANH**, **CANL**, and **RX** terminals.
   - Observe CANH, CANL, and RX signals on the oscilloscope.
4. To use the device in Standby mode, set the **STB** switch to left.
   - Observe TX signal on the oscilloscope. In Standby mode, TX signal is high.
   - Apply CAN signal on **CANH** and **CANL**.
   - **RX** reports bus state (dominant or recessive), once the wake-up filter criteria is met.

10.2 Dual Supply

1. To use the board and device with dual supply, set the **VIO SEL** switch to right.
2. Set the VDD power supply to 5.0 V, and the VIO power supply to 3.3 V.
3. To use the device in Normal mode, set the **STB** switch to right.
   - Connect a 0 - 3.3 V square signal to **TX**, frequency 250 kHz and duty cycle 50%.
   - Connect an oscilloscope to **CANH**, **CANL**, and **RX** terminals.
   - Observe CANH, CANL, and RX signals on the oscilloscope.
4. To use the device in Standby mode, set the **STB** switch to left.
   - Observe TX signal on the oscilloscope. In Standby mode, TX signal is high.
   - Apply CAN signal on **CANH** and **CANL**.
   - **RX** reports bus state (dominant or recessive), once the wake-up filter criteria is met.

11 Evaluation Board Hardware Configuration

- The board is supplied from a unique 5.0 V supply, connected to the GND and VDD plugs. In this case, the VIO_SEL switch is positioned left.
- An additional 3.3 V supply is connected to the GND and VIO plugs. In this case, the VIO_SEL jumper switch is positioned right.
- A signal generator is connected to the GND and TX plugs.
- An oscilloscope is connected to the CANH and CANL plugs, and optionally to RX ad TX.

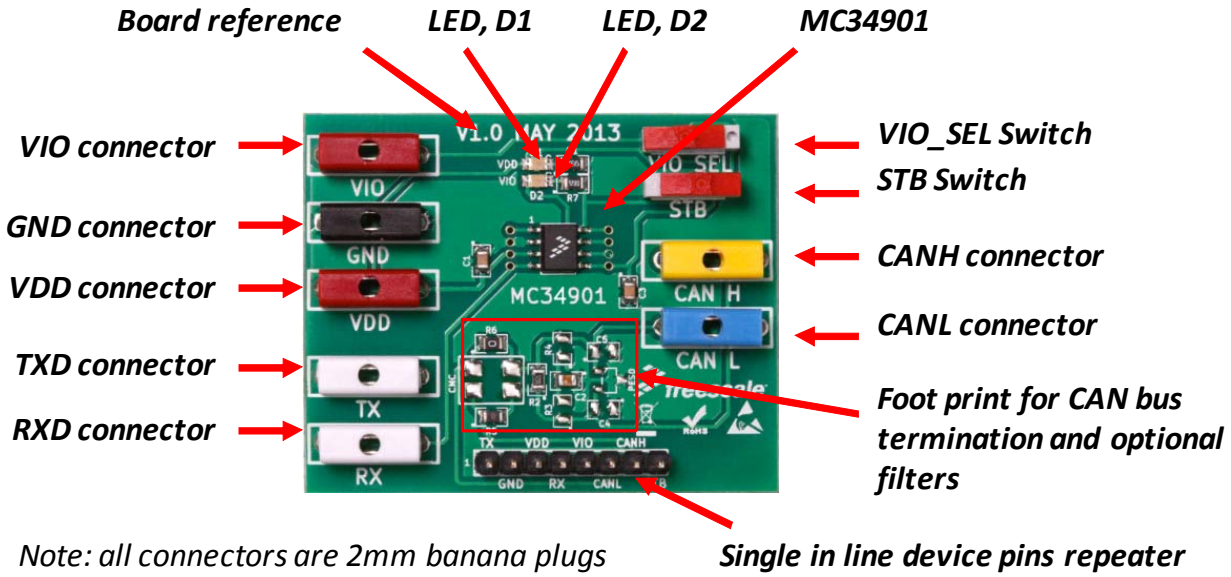


Figure 5. Jumper, Resistor, and Switch Settings

Table 1. Jumper and Switch Settings

Device Mode	Board Supply	STB Switch	VIO_SEL Switch	D1 LED	D2 LED	Comment
Standby	Single	Left	Left	ON	OFF	Device in Standby mode. Single 5.0 V supply for VDD and VIO. No CAN path from TX to bus. Bus wake-up reported on RX.
Normal	Single	Right	Left	ON	ON	Device in Normal mode. Single 5.0 V supply for VDD and VIO. CAN path from TX to bus and from bus to RX.
Standby	Dual	Left	Right	ON	OFF	Device in Standby mode. 5.0 V supply for VDD and 3.3 V for VIO. No CAN path from TX to bus. Bus wake-up reported on RX.
Normal	Dual	Right	Right	ON	ON	Device in Normal mode. 5.0 V supply for VDD and 3.3 V for VIO. CAN path from TX to bus and from bus to RX.

11.1 CAN Bus Termination Configuration

The board allows multiple variations for the mounting and usage of the external components. **Figure 6** shows multiple options.

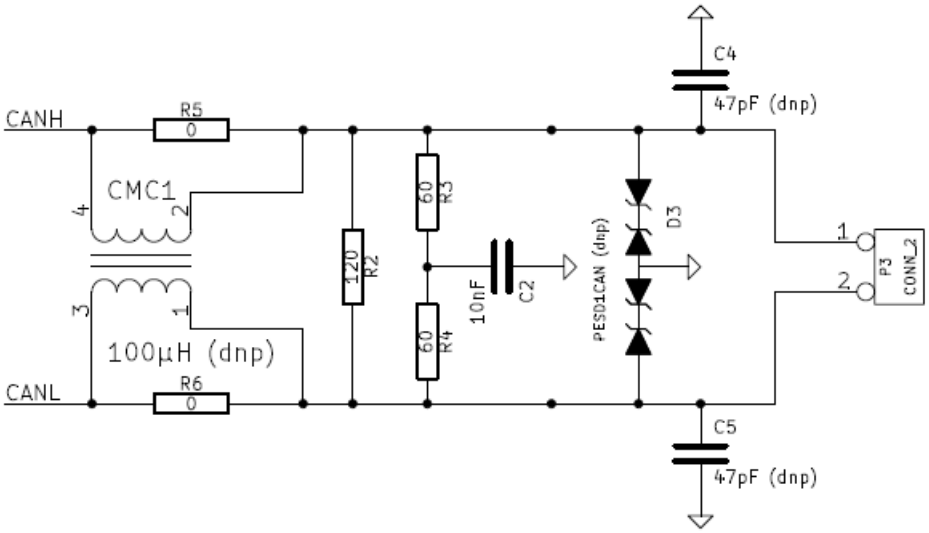


Figure 6. CAN Bus Termination

11.2 External Component Definition

This section defines the purpose and usage of the CAN bus termination components:

- R2, R3, R4, and C2: bus termination option (no termination, 60 Ohm, 120 Ohm, or split termination)
- R5, R6, and CMC1: common mode choke utilization
- C4, C5, and D3: extra bus filter and ESD protection

Table 2. External Component Definition

Use Case	R2	R3, R4, C2	R5, R6, CMC	C4, C5	D3
No termination	DNP	DNP	-	-	-
60 or 120 Ohm termination	Populate with R2 = 120 or R2 = 60 Ohm	DNP	-	-	-
Split termination (R3, R4, C2)	DNP	Populate with R3 = R4= 60 Ohm, C2 = 4.7 nF (example only)	-	-	-
No common mode choke	-	-	Populate R5 & R6 with zero Ohm	-	-
With common mode choke	-	-	R5 and R6 DNP. Populate CMC (ex 51uH)	-	-
Extra bus filter	-	-	-	Populate with 100pF (example)	-
Extra ESD protection	-	-	-	-	Populate with NUP2105 (example)

Notes

1. **DNP:** Do not Populate

12 Schematic

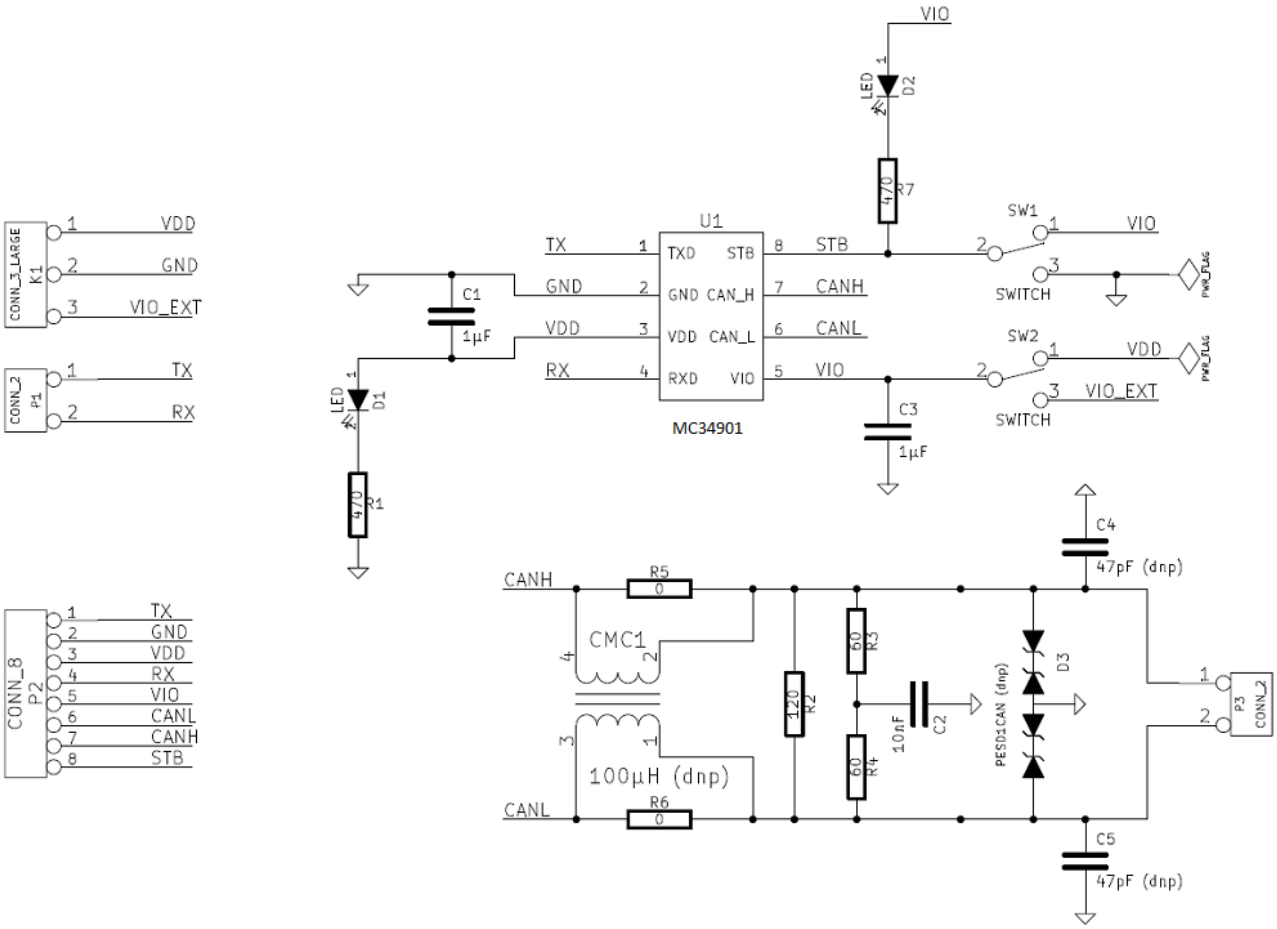


Figure 7. Evaluation Board Schematic

13 Board Layout

13.1 Top Layer Routing

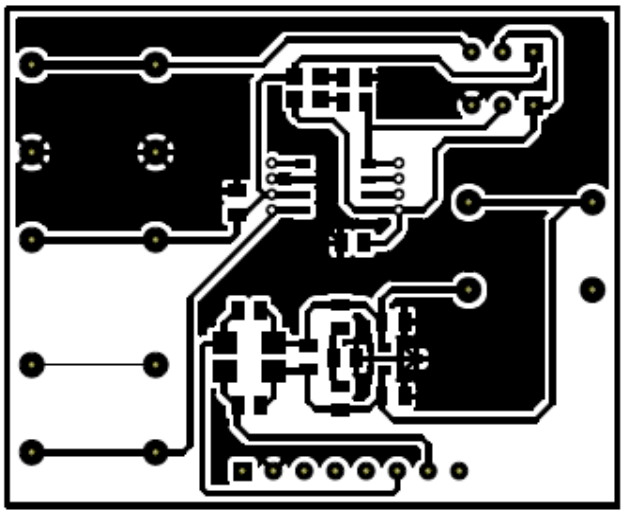


Figure 8. Top Layer Routing

13.2 Bottom Layer Routing

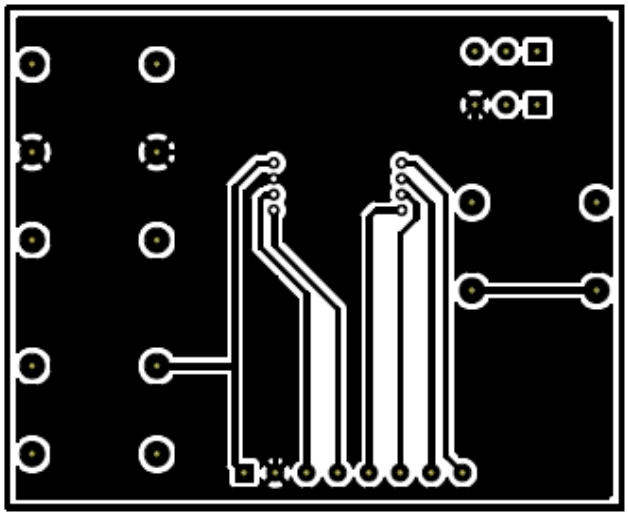


Figure 9. Bottom Layer Routing

14 Bill of Material

Qty	Schematic Label	Value	Description	Package	Populate
Freescale Component					
1	U1	-	MC34901	SOIC8	Yes
Diodes					
1	D1	LED0805	LED	0805	Yes
1	D2	LED0805	LED	0805	Yes
1	PESD1CAN1	PESD1CAN1	Zener	-	DNP
Capacitors					
1	C1	1µF	Capacitor	0805	Yes
1	C2	10nF	Capacitor	0805	Yes
1	C3	1µF	Capacitor	0805	Yes
1	C4	47pF	Capacitor	0805	DNP
1	C5	47pF	Capacitor	0805	DNP
Resistors					
1	R1	470 ohm	Resistor	0805	Yes
1	R2	120 ohm	Resistor	0805	Yes
1	R3	60 ohm	Resistor	0805	DNP
1	R4	60 ohm	Resistor	0805	DNP
1	R5	0	Resistor	0805	Yes
1	R6	0	Resistor	0805	Yes
1	R7	470 ohm	Resistor	0805	Yes

Qty	Schematic Label	Value	Description	Package	Populate
Switches, Connectors, Jumpers and Test Points					
1	RX	2mm banana plug	Connector	-	Yes
1	CAN_H1	2mm banana plug	Connector	-	Yes
1	CAN_L1	2mm banana plug	Connector	-	Yes
1	CMC1	B82789_100µH	Inductor	-	DNP
1	CONN1	Connector 8-pin	Connector Single In Line	-	Yes
1	GND1	2mm banana plug	Connector	-	Yes
1	SW1	Switch 2 positions	Connector	-	Yes
1	SW2	Switch 2 positions	Connector	-	Yes
1	TX	2mm banana plug	Connector	-	Yes
1	VDD1	2mm banana plug	Connector	-	Yes
1	VIO	2mm banana plug	Connector	-	Yes

Notes

2. Freescale does not assume liability, endorse, or warrant components from external manufacturers that are referenced in circuit drawings or tables. While Freescale offers component recommendations in this configuration, it is the customer's responsibility to validate their application.
3. **DNP:** Do not Populate

15 References

Following are URLs where you can obtain information on related Freescale products and application solutions:

Freescale.com Support Pages	URL
MC34901 Data Sheet	http://www.freescale.com/files/analog/doc/data_sheet/MC34901.pdf
MC34901 Product Summary Page	http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC34901
AN2409 Application Note	http://www.freescale.com/files/analog/doc/app_note/AN2409.pdf
Analog Home Page	http://www.freescale.com/analog
Automotive Home Page	http://www.freescale.com/automotive

15.1 Support

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16 Revision History

Revision	Date	Description of Changes
1.0	2/2014	• Initial Release

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